REMARKS

Specification Amendments:

Tables 8-13 are amended herein merely to correct typographical/columniation errors in the column headings and to clarify what numerical values the data represents. The column headings refer to electrical tests performed in the Examples. These headings were previously mislabeled such that the first column of each Table incorrectly referred to "Isc (A)." This inadvertent error caused the subsequent column headings to be incorrect as well. After amendment, the column headings are properly aligned and designated, from left to right, as Δ Temp %; Δ ISC %; Δ Vmax %; Δ Imax %; Δ FF %, and Δ Pmax %. These headings now properly identify the data as percent changes (Δ) in the appropriate electrical tests measured before and after ageing. A column designed as "Visuals" is also properly included in some of the tables. No new matter is added in the correction of the column headings.

Tables 8-13 are also amended to add an additional row to include the arithmetic mean (i.e., average) values for the aforementioned electrical tests. These arithmetic mean values are simply calculated from the values already present and, as such, are not new matter.

Claim Amendments:

Claims 2-4, 6, 8, 12-17, 31-34, 36, 38, and 39 remain pending in the instant application. Claims 18-27, 30, and 35 were previously withdrawn pursuant to the Applicant's claim election. Claims 1, 5, 7, 9-11, 19, 23, 28-30, and 37 were previously cancelled. Claim 40 is dependent on withdrawn claim 18 and thus is also withdrawn from examination.

Claims 18 and 36 are herein amended to make it clear that the silicone adhesive is formed from a silicone adhesive composition and that the silicone adhesive composition comprises (Ai) to (Di). These claims are also amended to make it clear that the silicone encapsulant is formed

from the liquid silicone encapsulant composition and that the liquid silicone encapsulant composition comprises (A) to (D). More specifically, these amendments are made because once the silicone adhesive/encapsulant compositions cure, they no longer include (Ai) to (Ci) or (A) to (C), respectively. Simply stated, once cured, (Ai) to (Ci) react to form the silicone adhesive and (A) to (C) react to form the silicone encapsulant. In other words the silicone adhesive/encapsulant compositions are no longer present after curing because they have formed the silicone adhesive/encapsulant themselves, respectively.

Claims 18 and 36 are also amended to delete the final "wherein" clause that includes the limitations "the same or different." As the Applicant's attorney discussed in an Interview with the SPE, and as summarized in the Interview Summary, these amendments are made to expedite prosecution, to clarify the scope of the claims, and to traverse the related 35 U.S.C. §112 ¶1 rejection.

Claims 18 and 36 are further amended to clarify a previous amendment. In the amendment filed on January 19, 2010, claim 36 was added as a new claim that included a misplaced viscosity limitation referring to the silicone adhesive itself. In the subsequent amendment filed on July 30, 2010, claim 18 was amended in a similar fashion. These limitations should instead have referred to the viscosity of the silicone adhesive *composition* before curing and not to the silicone adhesive itself (i.e., after curing). Accordingly, this is corrected herein. Support for these amendments is found at least in paragraph [0046] and [0047] of the application as filed wherein the inventors explicitly describe that the silicone adhesive composition includes components (Ai), (Bi), (Ci), and (Di) and that the "final viscosity of the resulting uncured *composition*…is preferably from 100 to 2000 mPa.s measured at 25°C…" (emphasis added).

Accordingly, the Applicant respectfully submits that these amendments are fully supported by the specification as filed and that no new matter is added.

Claim Rejections – 35 U.S.C. §112 ¶1 and ¶2:

First 35 U.S.C. §112 ¶1 Rejection:

The Examiner rejects claims 2-4, 6, 8, 12-17, 31-34, 36, 38, and 39 under 35 U.S.C. §112 ¶1 as failing to comply with the written description due to the limitation "the same or different." The Applicant herein deletes this limitation from both claim 36 and withdrawn claim 18 as agreed upon with the Examiner. Accordingly, the Applicant respectfully submits that the aforementioned rejections are now moot and should be withdrawn.

Second 35 U.S.C. §112 ¶1 Rejection:

The Examiner also rejects claim 39 under 35 U.S.C. §112 ¶1 as failing to comply with the written description. More specifically, the Examiner concludes that there is no support in the specification for the claimed limitation of "free of ethylene-vinyl acetate (EVA) copolymer."

As discussed with the SPE, the Applicant respectfully re-submits that the specification need only describe the claimed invention in sufficient detail such that one skilled in the art could reasonably conclude that the inventor had possession of the claimed invention at the time of filing.[1] Verbatim support is simply not required. In fact, the Applicant respectfully notes that the CCPA and the CAFC have held that the subject matter of the claims does not have to be described literally (*in haec verba*)[2] or word for word (*ipsis verbis*)[3]. As simply stated by the CAFC, if a skilled artisan would have understood the inventor to be in possession of the claimed invention at the time of filing, *even if every nuance of the claims is not explicitly described in the*

[1] See, e.g., *Moba, B.V. v. Diamond Automation, Inc.*, 325 F.3d 1306, 1319, 66 USPQ2d 1429, 1438 (Fed. Cir. 2003); *Pfaff v. Wells Elecs., Inc.*, 525 U.S. 55, 68 (1998); MPEP §2163; See also MPEP §2163

[2] *In re Lukach*, 442 F.2d 967, 969 USPQ 795 (CCPA 1971)

[3] *Fujikawa v. Wattanasin*, 93 F.3d 1559, 1570 (Fed. Cir. 1996)

specification, then the adequate description requirement is met.[4] In other words, what is conventional or well known to one of ordinary skill in the art need not be disclosed in detail.[5]

With respect to claims 38 and 39, the Applicant respectfully submits that those of skill in the art readily appreciate that one of the many goals of the instant application is to eliminate use of EVA, thereby creating a module that is "free of" EVA, as claimed. For example, in paragraph [0006] and [0011] of the application as filed, the inventors describe how EVA is expensive and that, when used, cost savings are minimized. Subsequently, in paragraphs [0013] and [0014] of the application as filed, the inventors go on and re-emphasize that EVA laminate is expensive, that there is a long felt need to reduce the costs of encapsulating solar cells, and that laminate (sheet) encapsulants (such as EVA) are ***replaced by*** a liquid encapsulant that reduces or ***eliminates*** the handling of laminate sheets. Going even further, in paragraph [0041] of the application as filed, the inventors state that the combination of encapsulant and topcoat (of this invention) are designed to ***replace*** EVA. Perhaps most importantly, the inventors directly compare embodiments of this invention (that are free of EVA) to comparative embodiments that include EVA in the Examples and show that the embodiments of this invention are superior.

The Applicant respectfully emphasizes to the Examiner that the perspective and understanding of one of skill in the art of solar module formation must be considered first and foremost. To these experts (and even in general), the language of the instant specification is abundantly clear and unmistakably describes both the replacement, and elimination of, EVA. The elimination of EVA from a solar module is the equivalent to, and entirely supports the claim limitations of claims 38 and 39 directed at, a module that is "free of" EVA. If EVA is eliminated from the module, then it is only logical that this same article is then "free of" EVA, as claimed.

[4] See MPEP §2163; See also *Vas-Cath*, 935 F.2d at 1563, 19 USPQ2d at 1116; *Martin v. Johnson*, 454 F.2d 746, 751, 172 USPQ 391, 395 (CCPA 1972).
[5] See MPEP §2163; See also *Hybritech Inc. v. Monoclonal Antibodies, Inc.*, 802 F.2d at 1384, 231 USPQ at 94; *Capon v. Eshhar*, 418 F.3d 1349, 1357, 76 USPQ2d 1078, 1085 (Fed. Cir. 2005)

For all of these reasons, the Applicant respectfully submits that there is full support in the specification as filed for claim 39 and that this §112 ¶1 rejection should be withdrawn.

35 U.S.C. §112 ¶2 Rejection:

The Examiner also rejects claims 2-4, 6, 8, 12-17, 31-34, 36, 38, and 39 under 35 U.S.C. §112 ¶2 for being indefinite relative to claimed ratios of the number of moles of silicon-bonded hydrogen to the total number of moles of silicon-bonded alkenyl groups. As summarized above, the Applicant's attorney discussed these rejections in detail with the SPE in the Interview on January 5, 2011. The SPE understood the Applicant's previously filed remarks and agreed that these rejections should be withdrawn. Accordingly, the Applicant respectfully requests that the Examiner withdraw these objections.

Claim Rejections – 35 U.S.C. §103:

The Examiner rejects claims 2-4, 6, 8, 12-17, 31-34, 36, 38, and 39 as obvious over U.S. Pat. No. 6,175,075 to Shiotsuka et al. in view of U.S. Pat. No. 5,569,689 to Stein. As described in detail in the previously filed Amendment, the Applicant respectfully disagrees with the Examiner's conclusion of *prima-facie* obviousness and respectfully re-submits these previous remarks. Notwithstanding the above, the Applicant further submits that the instant invention provides both superior and unexpected results from the perspective of one of skill in the art.

Comparison of Differences Between Claimed Invention and Combined Teachings of the Art:

As the Applicant explained in detail in the previously filed Amendment[6], the art focuses on use of hot-melt resin materials such as EVA, EMA, EEA, etc. in solar cells[7]. This is very

[6] In Col. 16, the '075 patent specifically states that "…EVA is *particularly preferable* because it exhibits well-balanced properties when used in a solar cell module" (emphasis added). In Col. 16, Lines 11-21, the '075 patent continues to extol the benefits of EVA. The patentees continue to describe the use and benefits of EVA throughout the detailed description and in the Examples (see, for example, Col. 24, Lines 43-62; Col. 25, Lines 9-17). The patentees even refer to the "good" results achieved using EVA (see Col. 28, Lines 63-64).

[7] See at least Col. 16, Lines 2-10, 11-21, and 60-67, and Col. 19, Lines 11-19 of the '075 patent

different from, and contrary to, the goals of the instant invention. For this reason, the art cited by the Examiner is not applicable to the instantly claimed invention.

In responding to this argument made by the Applicant, the Examiner asserts that disclosed examples and preferred embodiments in the art do not constitute a teaching away from a broader disclosure or non-preferred embodiments. While this statement may be procedurally accurate, <u>the broader argument is incomplete</u>. Admittedly, if the claims were rejected under §102, simple disclosure of each element of the claims in the art would be sufficient to support such a rejection. However, when rejecting the claims under §103, a more nuanced approach is required. As explained by the Supreme Court in *KSR*, obviousness rejections are dependent on whether the claimed invention represents the predictable use of prior art elements, *as recognized by one of skill in the art*. This is in accordance with CAFC precedent that holds that (i) the *<u>totality</u>* of the prior art must be considered and that (ii) proceeding contrary to *accepted wisdom in the art* is evidence of non-obviousness[8].

In this case, the inventors describe in the background of the invention that the prior art prefers to utilize EVA and that this use is undesirable. The art cited by the Examiner supports this description and goes even further in extolling the virtues of using EVA and describing how and why EVA is important, superior, and preferred for use. In essence, *<u>the art cited by the Examiner establishes the traditional wisdom in the art</u>*, i.e., the traditional wisdom that EVA is superior and preferred for use in solar modules. It is against this backdrop that the obviousness of the claims must be evaluated. As such, when the instant invention explicitly proceeds contrary to this accepted wisdom, the invention is clearly not obvious.

[8] See MPEP §2145; See also *In re Hedges,* 783 F.2d 1038, 228 USPQ 685 (Fed. Cir. 1986)

Description of Superior and Unexpected Results of this Invention:

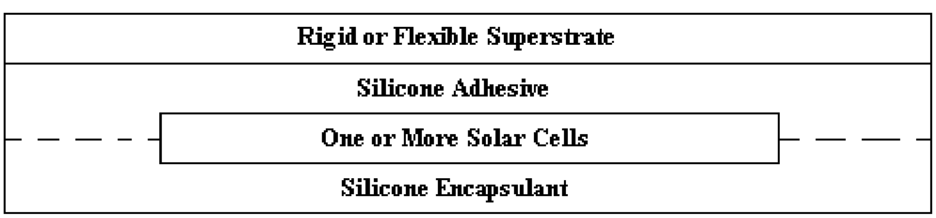
In the most recent previously filed Amendment, the Applicant also set forth an explanation of the superior and unexpected results achieved by the instant invention. However, the Applicant respectfully submits that these results were not given appropriate weight or consideration by the Examiner. Accordingly, and in view of the Interview with the SPE, the Applicant re-submits similar, but more detailed, remarks below focusing on the superior and unexpected results.

Benefits Provided by the Instant Invention:

The particularly claimed components and compounds of this invention have been developed to be compatible with each other. For example, the silicone adhesive composition utilizes a particular weight amount of compounds and a particular default molar ratio (i.e. a molar ratio of 1:1 or less) of silicon-bonded hydrogen atoms to silicon-bonded alkenyl groups. This default molar ratio reduces the degree of hydrosilylation reaction and curing of the composition thereby increasing the softness and stickiness of the silicone adhesive. The softness and stickiness are important (1) to promote maximum adhesion to both the superstrate and the one or more solar cells. However, the softness and stickiness is also balanced and customized such that, (2) upon compression (e.g. "squeezing" of the solar cell and superstrate), air bubbles are pushed out of the silicone adhesive/composition and minimized. This increases the performance and efficiency of the solar cell modules. Moreover, the softness and stickiness is also balanced and customized to (3) allow the silicone adhesive to effectively adhere to the silicone encapsulant. This combination of softness and stickiness, and the results achieved as a direct result thereof, are both surprising and unexpected and allow for a superior solar cell module to be formed.

The silicone encapsulant composition also utilizes a particular weight amount of compounds and a particular excess molar ratio (i.e., a molar ratio of greater than 1:1) of silicon-bonded hydrogen atoms to silicon-bonded alkenyl groups. This excess molar ratio promotes the degree of hydrosilylation reaction and cure of the silicone encapsulant composition and the hardness and rigidity of the silicone encapsulant itself. The hardness and rigidity of the silicone encapsulant allows the solar cell module to be formed with excellent physical strength and durability without the need for extra reinforcing tie layers or backsheets such as EVA and other expensive substrates, as described above.

Referring back to the solar cell module as a whole, even though the silicone adhesive and the silicone encapsulant provide excellent results independently from one another, these results would be of little use if the silicone adhesive and the silicone encapsulant could not be effectively used together. In this invention, the claimed chemistry simultaneously promotes the superior results described above and the adhesion and compatibility of the silicone adhesive and the silicone encapsulant with one another. As just one non-limiting example, the solar cell module may have the structure illustrated below wherein the silicone adhesive and the silicone encapsulant effectively adhere to each other (at the dashed line):



In addition, and as more completely described and exhibited in the Examples, this invention provides a myriad of physical, chemical, and electrical advantages over what would otherwise be expected (and demonstrated) by the comparative examples of the art. However, on

Page 12 of the most recent Office Action, the Examiner concludes that the art teaches that all beneficial results are expected and therefore obvious.

The Applicant respectfully disagrees with the Examiner and submits that none of the physical, chemical, or electrical advantages, exhibited by this invention and exemplified in the Examples, whether taken alone or in combination with each other, are disclosed, taught, suggested, or even remotely recognized in the art as associated with the particularly claimed chemistry of this invention. In fact, the inventors, who are persons highly skilled in this art, even commented on these unexpected results in the text of the Examples. In essence, this commentary serves as a type of inventor declaration that the results achieved by this invention are totally unexpected over, and superior to, the results achieved by the art. For this reason, it is improper to conclude that one of skill in the silicone-solar cell arts would obviously choose the particularly claimed chemistry that just happens to exhibit superior and unexpected results in the *numerous* physical, chemical, and electrical tests that are described above and in the specification.

Further Explanation of the Chemistry of Examples 1-15 and the Tests Performed

For the benefit of the Examiner, the Applicant provides a further explanation of the chemistry of Examples 1-15 below and sets forth a comparison of the chemistry of these examples to the chemistry of the pending claims.

Example 1:

In this Example, 35.42 g of α,ω-dimethylvinylsiloxy terminated polydimethylsiloxane having a molecular weight of 62000 g/mole and vinyl content of 0.15% is utilized. This siloxane corresponds to claimed element (Ai).

This Example also utilizes 7 g of poly(dimethyl siloxane-co-methylhydrogensiloxane) containing 1.45% of hydrogen units. This siloxane corresponds to claimed element (Ci).

This Example further utilizes 47.22 g of p-xylene solution of dimethylvinylated MQ resin (63% resin in Xylene). This resin corresponds to claimed element (Bi). This Example also utilizes 20 ppm of a platinum catalyst that corresponds to claimed element (Di).

Moreover, this Example utilizes 0.825 g of dimethylhydrogen siloxy terminated trifluoropropyl silsesquioxane. This compound serves as a second cross-linking agent that contributes very little to the overall chemistry of this invention but is effective in minimizing dirt pickup or accumulation by the silicones of the invention.

Notably, the silicone composition Example 1 was coated on two glass panels and cured to form films (see Silicone Material Samples 1 and 2). After formation, these films were directly compared to various commercially available EVA films of the same thickness (see EVA1, EVA2, EVA3) to determine UV and visual light transmittance through the glass. The results of these evaluations are set forth in Table 1.

The silicone composition of Example 1 evidences superior and unexpectedly high percentages of ultraviolet and visible light transmittance as compared to the EVA compositions of the art. This maximizes the amount light reaching the solar cells that can be converted into electrical energy. More specifically, the silicone composition of Example 1 shows a higher light transmission at 300 and 500 nm and similar transmission at 633 mm as compared to the EVA. The absorbed UV energy causes EVA to yellow and to brown and this effect is known to affect the visible light transmission.

<u>Example 2:</u>

Example 2 utilizes the same chemistry as described above in Example 1. Example 2 also compares films of this invention at 100 and 200 μm thicknesses (see Silicone Encapsulant Thickness 100 and 200 μm) to a Tefzel® film having a thickness of 25 μm (see Teflex Thickness

25 μm) and an EVA/Tefzel® laminated film having a thickness of 200 μm (see the heading of Table 2). Each of these films were evaluated to determine % of light transmission as a function of abrasion cycles (Taber 5131, Calubrase CS-10). The results of these evaluations are set forth in Table 2.

The data set forth in Table 2 demonstrates that Example 2 evidences superior and unexpectedly high taber abrasion resistance in conjunction with light transmittance of films of this invention as compared to films of the art. More specifically, after 40 and 80 cycles, the Tefzel lost 25% and 35% of the light transmission respectively while the films of this invention lost only 8% of the light transmission after 100 cycles.

Example 3:

Example 3 also utilizes the same chemistry as described above for Example 1 except that amounts of catalyst were changed. Samples were then cured to form films of this invention that were subsequently evaluated to determine Shore A Hardness as a function of platinum concentration for a top surface and a bottom surface of the films. The results of these evaluations are set forth in Table 3.

At 2.8 ppm of the catalyst, the sample is skinned at the surface but does not fully cure. At higher concentrations of catalyst, the top surface of the film is harder than the bottom surface of the film indicating a faster or complete cure at the surface than in the bulk. As described in Example 3, the comparatively high hardness values of the top surface indicate a high abrasion resistance and good surface properties, while the lower hardness values of the bottom surface indicates the presence of a softer material, which is beneficial for cell protection. Harder materials that are in contact with a solar cell surface are more likely to induce high stress at the cell/material interface thereby increasing potential premature delamination, especially during

thermal cycle change. In sum, Example 3 evidences superior and unexpectedly high Shore A Hardness of various embodiments of this invention. This hardness strengthens the solar cell module and minimizes/eliminates the need for additional substrates or tie layers (such as EVA, as described above).

Example 4:

This Example again utilizes the same chemistry as described above in Example 1. Samples in this Example were cured to form films of this invention that were subsequently evaluated after a damp heat test to determine whether delamination would occur. The results of Example 4 are summarized in the text as follows: "[n]o visible delamination could be observed, even after 60 days, the sample was still exhibiting a very good adhesion to the glass." In sum, Example 4 evidences superior and unexpected adhesion of an additional embodiment of the invention after damp heating.

Example 5:

This Example also utilized the chemistry in Example 1 except that the SiH:vinyl ratio was changed to greater than 1. Samples of this chemistry were cured on glass panels to form films that were evaluated to determine scratch resistance. The results of Example 5 are summarized in the text as follows: "[t]he sample hardens rapidly to impart a high scratch resistance surfaces to the glass surface."

Example 6:

This Example repeated the testing of Example 5 but utilized four interconnected solar cells. The results of Example 6 are not set forth in any table. However, these results were also positive in the same way as reported in Example 5.

Example 7:

This example focuses on encapsulation and utilizes the same chemistry as in Example 1 but utilizes different amounts of each of the compounds. The different amounts were used because a longer bath life was needed to encapsulate the thin film solar cells. More specifically, a series of thin film solar cells were encapsulated using the encapsulant of this invention to form modules. One sample did not include a frame. A second sample included a frame. After encapsulation, the modules were exposed to Humidity Freeze conditions as described in IEC 1646. A control cell, with no encapsulation, was also evaluated. The results of these evaluations are set forth in Table 4.

The data set forth in Table 4 and summarized in the subsequent paragraphs of the specification indicate that none of the inventive samples showed any discoloration or delamination and all samples passed the standard wet leakage current test as described in IEC 1646 (see paragraphs [0111]-[0112] of the application as filed). In addition, the inventors go on to describe that the inventive modules pass the open circuit, leakage current, and maximum power tests of tests of IEC 1646. Perhaps most importantly, the inventors, who are persons of skill in this art, unequivocally state that "[t]hese findings are *totally contrary to the expectations of the industry* and use of a silicone encapsulant as hereinbefore described is able to provide the level of protection suitable for solar or photovoltaic module" (emphasis added).

Example 8:

This example utilizes the same procedure and same chemistry as in Example 7 except that different types of solar cells were used (see Types a, b, c, and d in Table 5). Just as in Example 7, a series of thin film solar cells were encapsulated using the encapsulant of this invention to form modules. One sample of each type (Types a-d) did not include a frame. A

second sample of each type (Types a-d) included a frame. After encapsulation, the modules were exposed to Humidity Freeze conditions as described in IEC 1646. Four different control cells (one for each of Types a-d) with no encapsulation, were also evaluated. The results of these evaluations are set forth in Table 5.

Again, as summarized by the inventors in the paragraphs following Table 5, none of the samples tested showed any discoloration or delamination and all samples passed the standard wet leakage current test as defined in the IEC 1646 after the conditioning period (see paragraphs [0115]-[0117] of the application as filed). Moreover, all of the samples passed the open circuit, leakage current, and maximum power tests of tests of IEC 1646. The inventors then went further and again reaffirmed that the findings in Table 5 "*are totally contrary to the expectations of the industry* and use of a silicone encapsulant as hereinbefore described is able to provide the level of protection suitable for solar or photovoltaic module with both framed and unframed modules" (emphasis added).

Example 9:

This example utilizes the same general chemistry for the adhesive and the encapsulant as set forth in examples 1 and 7, respectively. More specifically, a series of solar cells were adhered to a glass substrate using the adhesive of this invention and encapsulated using the encapsulant of this invention, to form a series of modules, respectively. After formation, four identical samples (see samples 1-4) were evaluated to determine maximum power both before and after Humidity Freeze testing according to IEC 1215. Different samples were aged for different amounts of time. The results of these evaluations are set forth in Table 6.

Just as described above, the inventors again summarize the data set forth in Table 6 and affirm that none of the samples showed discoloration or delamination and all passed the wet

leakage current test as described in the IEC 1215 after the conditioning (see paragraphs [0123]-[0124] of the application as filed). Moreover, all of the samples passed the open circuit, leakage current, and maximum power tests of tests of IEC 1215. The inventors then again went further and again reaffirmed that the findings in Table 6 "<u>*are totally contrary to the expectations of the industry*</u> and use of a silicone encapsulant as hereinbefore described is able to provide the level of protection suitable for solar or photovoltaic module of a polycrystalline Silicon wafer type" (emphasis added).

<u>Example 10:</u>

This example utilizes the same chemistry and procedure as in Example 8 for both the adhesive and the encapsulant of this invention but utilizes a different type of commercially available solar cell. After formation, three identical samples (see samples 1-3) were evaluated to determine maximum power both before and after Humidity Freeze testing according to IEC 1215. Different samples were aged for different amounts of time. The results of these evaluations are set forth in Table 7.

Just as described above, the inventors again summarize the data set forth in Table 7 and affirm that none of the samples showed discoloration or delamination and all passed the wet leakage current test as described in the IEC 1215 after the conditioning (see paragraphs [0127]-[0128] of the application as filed). Moreover, all of the samples passed the open circuit, leakage current, and maximum power tests of tests of IEC 1215. The inventors then again went further and again reaffirmed that the findings in Table 7 "<u>*are totally contrary to the expectations of the industry*</u> and use of a silicone encapsulant as hereinbefore described is able to provide the level of protection suitable for solar or photovoltaic module of a polycrystalline Silicon wafer type" (emphasis added).

Example 11:

This Example utilizes the same chemistry as set forth in Example 5 except with a modified curtain coater. More specifically, samples of this chemistry were cured on glass panels to form films that were evaluated to determine scratch resistance. The results of Example 11 are summarized in the text as follows: "[t]he encapsulant cured rapidly to impart a high scratch resistance surfaces to the glass surface."

Example 12:

This Example utilizes the same chemistry as Example 11 except that 4 interconnected solar cells were manually glued onto the glass panels using the adhesive. Again, the results of Example 12 are not set forth in any table. However, these results were also positive in the same way as reported in Example 11.

Examples 13-15 and Amended Tables 8-13:

Examples 13-15 utilize the chemistry of Example 9 relative to the adhesive and the chemistry of Example 7 relative to the encapsulant. Each of Examples 13-15 are further explained immediately below.

Example 13:

In Example 13, solar modules were formed and were subjected to UV ageing for 600 hours as described in Example 13 and subsequent paragraphs. A series of electrical tests were performed both before and after the UV ageing.

A series of comparative modules were formed that include EVA/Tedlar. The data from the electrical tests of these comparative modules is set forth in Table 8. In Table 8, the comparative modules are designated as examples "Comp A" and "Comp B." These two examples are identical to each other relative to chemistry and structure of the module, i.e., they

were both formed according to Example 13 and included EVA/Tedlar but did <u>not</u> include the chemistry of this invention. These examples are delineated simply to show that each electrical test was performed twice, one per each sample. These comparative modules were also evaluated relative to a commercially reference module, i.e., “Reference” in Table 8. This reference module was aged on a laboratory bench, with no particular UV source, under standard laboratory conditions.

In addition, a series of inventive modules was also formed that included the chemistry of this invention. The data from the electrical tests of the inventive modules is set forth in Table 9. In Table 9, the inventive modules are designated as examples “Ex A,” “Ex B,” and “Ex C.” These examples are identical to each other relative to chemistry and structure of the module, i.e., they were both formed according to Example 13 and included the chemistry of this invention. These examples are delineated simply to show that each electrical test was performed three times, one per each example. These inventive modules were also evaluated relative to a reference module, i.e., “Ex Reference” in Table 9. This reference module is the same as “Reference” in Table 8 as described above.

As described above, both Tables 8 and 9 are amended herein to correct the column headings. As described above, the column headings are properly aligned and designated, from left to right, as Δ Temp %; Δ ISC %; Δ Vmax %; Δ Imax %; Δ FF %, Δ Pmax %, and Visuals. These headings are now correct and properly identify the data as percent changes (Δ) in these electrical tests both before and after UV ageing. In addition, a row is added to these Tables that includes the arithmetic mean of the aforementioned percent changes. The “Visuals” column represents a visual evaluation of the modules before and after ageing to determine whether any cracking, bubbling, or discoloration occurred.

In Tables 8 and 9, Comp A and Comp B lost more Power and FF than the Reference. However, both Comp A and Comp B passed the electrical tests by having less than 5% change after UV ageing. The data set forth in Table 9 shows that all the samples in accordance with the present invention were encapsulated with no initial failure and passed the electrical tests. The loss in power of Ex A, B, and C is generally similar to the loss of power results for the Ex Ref sample. In general all the samples submitted to the 600 h QUV ageing did not lose their property at all compared to the reference.

Example 14:

In Example 14, additional inventive modules, comparative modules, and reference modules were formed and were subjected to thermal cycling and humidity freezing. A series of electrical tests were performed both before and after the thermal cycling and humidity freezing.

The data from the electrical tests of the comparative modules and the inventive modules is set forth in Tables 10 and 11, respectively. In both Tables 10 and 11, the "Reference" module is the same as in Example 13. Moreover, in Table 10, the examples "Comp C", "Comp D", and "Comp E" are again identical to each other relative to chemistry and structure, i.e., they were both formed according to Example 13 and include EVA/Tedlar but did not include the chemistry of this invention. These examples are delineated simply to show that each electrical test was performed three times, one per each sample.

Similarly, in Table 11, the examples "Ex D", "Ex E" and "Ex F" are identical to each other relative to chemistry and structure of the modules, i.e., they were both formed according to Example 13 and included the chemistry of this invention. These examples are delineated simply to show that each electrical test was performed three times, one per each sample.

Both Tables 10 and 11 are amended herein, as described above, to correct the column headings. Just as described above, the column headings are properly aligned and designated, from left to right, as Δ Temp %; Δ ISC %; Δ Vmax %; Δ Imax %; Δ FF %, and Δ Pmax %. These headings are now correct and properly identify the data as percent changes (Δ) in these electrical tests both before and after exposure to the thermal cycling and humidity freezing. In addition, a row is added to these Tables that includes the arithmetic mean of the aforementioned percent changes.

In both Tables 10 and 11, the data indicates that all modules passed the electrical tests by having less than 5% change after thermal cycling and humidity freezing. This data is very surprising to those of skill in the art because failure and delamination of the modules would be expected at the interface of the silicone adhesive and the silicone encapsulant of this invention. However, this failure and delamination did <u>not</u> occur. Instead, the data shows that the modules of this invention are surprisingly robust and able to withstand thermal cycling and humidity freezing that would traditionally be expected to destroy the modules.

<u>Example 15:</u>

In Example 15, additional inventive modules, comparative modules, and reference modules were formed and were subjected to damp heat conditions. A series of electrical tests were performed both before and after the damp heat conditioning.

The data from the electrical tests of the comparative modules and the inventive modules is set forth in Tables 12 and 13, respectively. In both Tables 12 and 13, the "Reference" module is the same as in Example 13. Moreover, in Table 12, the examples "Comp F", "Comp G", and "Comp H" are again identical to each other relative to chemistry and structure, i.e., they were both formed according to Example 13 and included EVA/Tedlar but did <u>not</u> include the

chemistry of this invention. These examples are delineated simply to show that each electrical test was performed three times, one per each sample.

Similarly, in Table 13, the examples “Ex G”, “Ex H” and “Ex I” are identical to each other relative to chemistry and structure, i.e., they were both formed according to Example 13 and included the chemistry of this invention. These examples are delineated simply to show that each electrical test was performed three times, one per each sample.

Both Tables 12 and 13 are amended herein, as set forth above, to correct the column headings. Just as described above, the column headings are properly aligned and designated, from left to right, as Δ Temp %; Δ ISC %; Δ Vmax %; Δ Imax %; Δ FF %, and Δ Pmax %. These headings are now correct and properly identify the data as percent changes (Δ) in these electrical tests both before and after exposure to the damp heat conditioning. In addition, a row is added to these Tables that includes the arithmetic mean of the aforementioned percent changes.

In both Tables 12 and 13, the data indicates that all modules passed the electrical tests by having less than 5% change after the exposure to the damp heat conditioning. Just as above, this data is very surprising to those of skill in the art because failure and delamination of the modules would be expected at the interface of the silicone adhesive and the silicone encapsulant of this invention. However, this failure and delamination did <u>not</u> occur. Instead, the data shows that the modules of this invention are surprisingly robust and able to withstand damp heat conditioning that would traditionally be expected to destroy the modules.

<u>Summary of Superior and Unexpected Results:</u>

As clearly set forth in the data of the Examples and as explained above, the claimed invention provides various physical, chemical, and electrical advantages over what would

otherwise be expected (and demonstrated) by the comparative examples of the art. In fact, the inventors, who are persons highly skilled in this art, even commented on these unexpected results in the text of the Examples. In essence, this commentary serves as a type of inventor declaration that the results achieved by this invention are totally unexpected, and superior to, the results achieved by the art.

None of the physical, chemical, or electrical advantages, exhibited by this invention and exemplified in the Examples, whether taken alone or in combination with each other, are disclosed, taught, suggested, or even remotely recognized in the art as associated with the particularly claimed chemistry of this invention. Accordingly, it is improper to conclude that one of skill in the silicone-solar cell arts would obviously choose the particularly claimed chemistry that just happens to exhibit superior and unexpected results in the *numerous* physical, chemical, and electrical tests that are described above and in the specification. The selection of the claimed chemistry simply could not occur by chance or mere review of the prior art, even by those of high skill in the art. Moreover, the selection of the claimed chemistry is not even predictable or obvious. There are simply too many results achieved by this invention that are both superior and unexpected to conclude that one of skill in the art would stumble upon this chemistry by chance, or for that matter, even by skill. This claimed invention is novel, non-obvious, and produces excellent results that are surprising, unpredictable, unexpected, and superior over the art.

Conclusion

In view of the above, the Applicant respectfully submits that all of the pending claim rejections are overcome and that all claims are both novel and non-obvious. Accordingly, the Applicant respectfully submits that all pending claims are in condition for allowance and respectfully requests such allowance.

While it is believed that no further fees are presently due, the Commissioner is authorized to charge the Deposit Account No. 08-2789, in the name of Howard & Howard Attorneys PLLC, for any fees or credit the account for any overpayment.

Respectfully submitted,

HOWARD & HOWARD ATTORNEYS PLLC

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Date

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